WHAT IS CLAIMED IS:

1. A bipolar transistor comprising:

a first semiconductor layer;

a collector layer formed in an upper surface region of the first semiconductor layer and containing an impurity of a first conductive type;

two isolation layers formed of an insulating film so that the isolation layers are spaced apart from each other and the collector layer is located therebetween;

a second semiconductor layer grown on the first semiconductor layer and the isolation layers, having a different band gap from that of the first semiconductor layer and containing an impurity of a second conductive type;

a third semiconductor layer formed on the second semiconductor layer and having a different band gap from that of the second semiconductor layer;

an insulating film formed on the third semiconductor layer and including an emitter opening portion; and

an emitter electrode formed of a polycrystalline semiconductor containing an impurity of the first conductive type so as to fill the emitter opening portion,

wherein a region of the third semiconductor layer which is in contact with the emitter electrode is an emitter layer containing an impurity of the first conductive type,

wherein a region of the second semiconductor layer interposed between the emitter layer and the collector layer is an intrinsic base layer containing an impurity of the second conductive type,

wherein regions of the second and third semiconductor layers each surrounding the intrinsic base layer together form an external base layer containing an impurity of the second conductive type,

wherein the external base layer is provided so as to extend between the isolation

layers and has a silicide layer in a surface portion, and

wherein the emitter electrode has a thickness with which ions of the second-conductive-type impurity implanted into the emitter electrode to form the external base layer are diffused so that the concentration of the impurity is a low level in a lower portion of the emitter electrode.

2. The bipolar transistor of claim 1, wherein the thickness of the emitter electrode is in a range between not less than 200 nm and not more than 500 nm.

3. The bipolar transistor of claim 1, wherein a recess formed in aprt of an upper surface of the emitter electrode located over the emitter opening portion has an aspect ratio of 1/5 or less.

4. The bipolar transistor of claim 1, wherein ions of the second-conductive-type impurity are implanted into a region of the external base layer extending from a position of the substrate on a side of and under the emitter electrode to a distance of 230 nm from a boundary portion of the substrate between the emitter layer and the intrinsic base layer.

5. The bipolar transistor of claim 1, further comprising:

an interlevel insulating film covering the emitter electrode and the external base layer; and

a conductor plug formed so as to pass through the interlevel insulating film and being in contact with each of the isolation layers of the external base layer.

6. The bipolar transistor of claim 1,

wherein the first semiconductor layer has a Si single crystal composition, and

wherein the second semiconductor layer has a SiGe or SiGeC mixed crystal composition.

7. A method for fabricating a bipolar transistor, comprising the steps of:

a) epitaxially growing on a first semiconductor layer of a first conductive type surrounded by isolation layers, a second semiconductor layer having a different band gap from that of the first semiconductor layer and containing an impurity of a second conductivity type so as to extend between the isolation layers;

b) epitaxially growing on the second semiconductor layer, a third semiconductor layer having a different band gap from that of the second semiconductor layer;

c) forming on the third semiconductor layer, an insulating film having an emitter opening portion;

d) forming on the third semiconductor layer and the insulating film, a polysilicon layer containing an impurity of the first conductivity;

e) patterning the polycrystalline layer and the insulating layer to form an emitter electrode; and

f) implanting ions of an impurity of the second conductive type into the second and third semiconductor layers from a direction tilted from a perpendicular direction with respect to a surface of a substrate using the emitter electrode and the insulating film as masks.

8. The method of claim 7, further comprising the step of g) drive-in-diffusing an impurity of the first conductive type from the emitter electrode into the third semiconductor layer to form an emitter layer in a region of the third semiconductor layer

located under the emitter opening portion,

wherein in the step f), ion implantation of an impurity of the second conductive type is performed under the condition in which the second-conductive-type impurity does not go over a point of 230 nm from the boundary between the emitter layer and the second semiconductor layer to reach a portion of the substrate located closer to the emitter layer.

9. The method of claim 7, further comprising: after the step f),

the step h) of forming an insulator sidewall on side surfaces of the emitter electrode and the insulating film; and

the step i) of siliciding upper portions of the third semiconductor layer and the emitter electrode using the insulator sidewall as a mask.

10. The method of claim 7, wherein in the step d), a polycrystalline layer having a thickness of not less than 200 nm and not more than 500 nm.

11. The method of claim 7,

wherein the first semiconductor layer has a Si single composition, and

wherein in the step a), the second semiconductor layer having a SiGe or SiGeC mixed crystal composition is grown.